[AI Assisted Coding]

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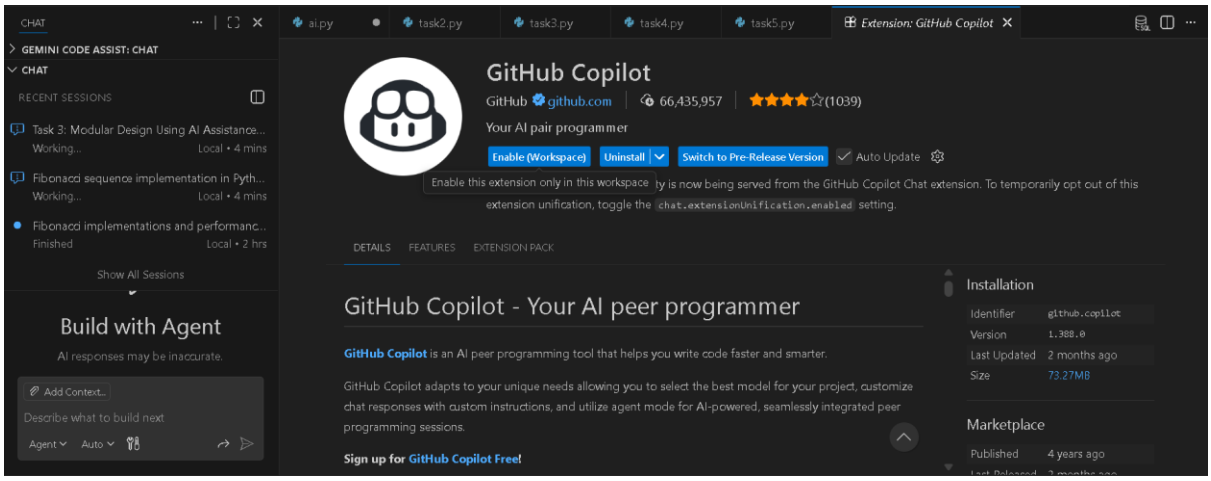
**BATCH - 06**

**Lab 1: Environment Setup – GitHub Copilot and VS Code Integration +**

**Understanding AI-assisted Coding Workflow**

**Lab Objectives:**

**Week1 -**




**Task 1: AI-Generated Logic Without Modularization (Fibonacci Sequence**

**Without Functions)**

**PROMPT:**

Task 1: AI-Generated Logic Without Modularization (Fibonacci Sequence

Without Functions)

❖ Scenario

You are asked to write a quick numerical sequence generator for a learning

platform prototype.

❖ Task Description

Use GitHub Copilot to generate a Python program that:

➢ Prints the Fibonacci sequence up to n terms

➢ Accepts user input for n

➢ Implements the logic directly in the main code

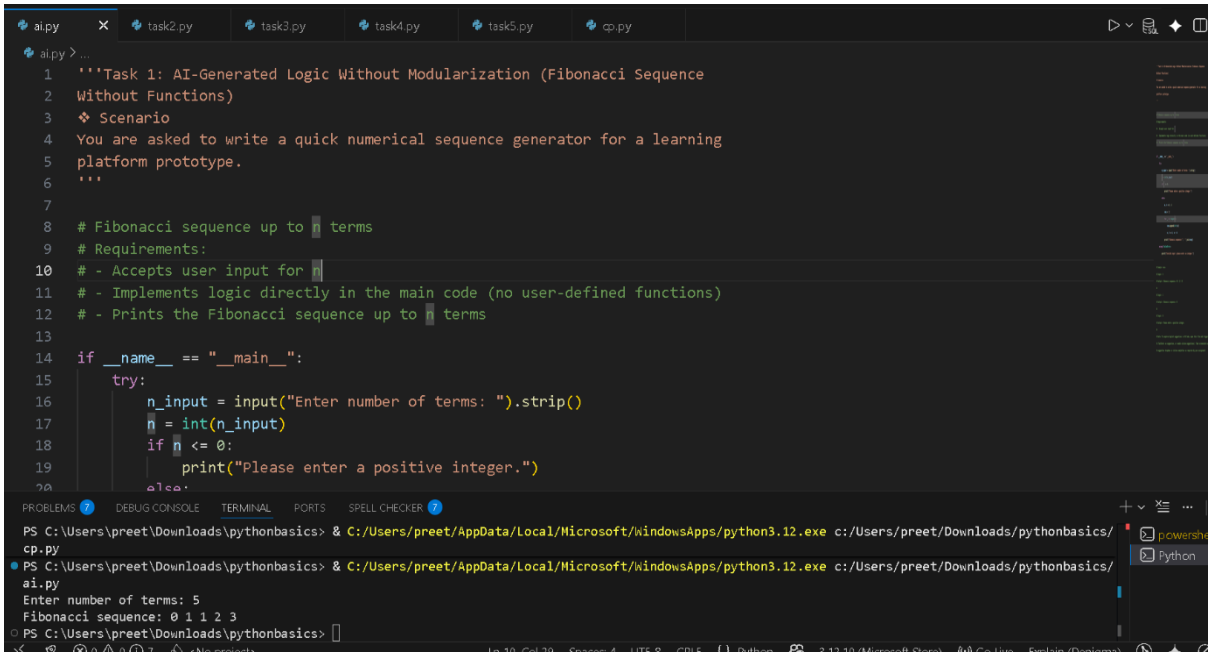
➢ Does not use any user-defined functions

❖ Expected Output

➢ Correct Fibonacci sequence for given n

➢ Screenshot(s) showing Copilot-generated suggestions

➢ Sample inputs and outputs




**OUTPUT:** Enter number of terms: 5

Fibonacci sequence: 0 1 1 2 3

**Code Explanation (Fibonacci without functions)**

- input() → takes number of terms from user
- int() → converts input to integer
- if n <= 0 → checks for invalid (non-positive) input

- a, b = 0, 1 → starting Fibonacci numbers
- for _ in range(n) → runs loop n times
- seq.append(str(a)) → stores current Fibonacci number
- a, b = b, a + b → updates values for next term
- " ".join(seq) → prints numbers in one line
- try / except → handles invalid (non-integer) input safely

**Output:** Prints Fibonacci sequence up to n terms.

## Task 2: AI Code Optimization & Cleanup (Improving Efficiency)

### PROMPT: Task 2: AI Code Optimization & Cleanup (Improving Efficiency)

❖ Scenario

The prototype will be shared with other developers and needs

optimization.

❖ Task Description

➢ Examine the Copilot-generated code from Task 1 and improve it by:

➢ Removing redundant variables

➢ Simplifying loop logic

➢ Avoiding unnecessary computations

➢ Use Copilot prompts such as:

▪ “Optimize this Fibonacci code”

▪ “Simplify variable usage”

Hint:

Prompt Copilot with phrases like

“optimize this code”, “simplify logic”, or “make it more readable”

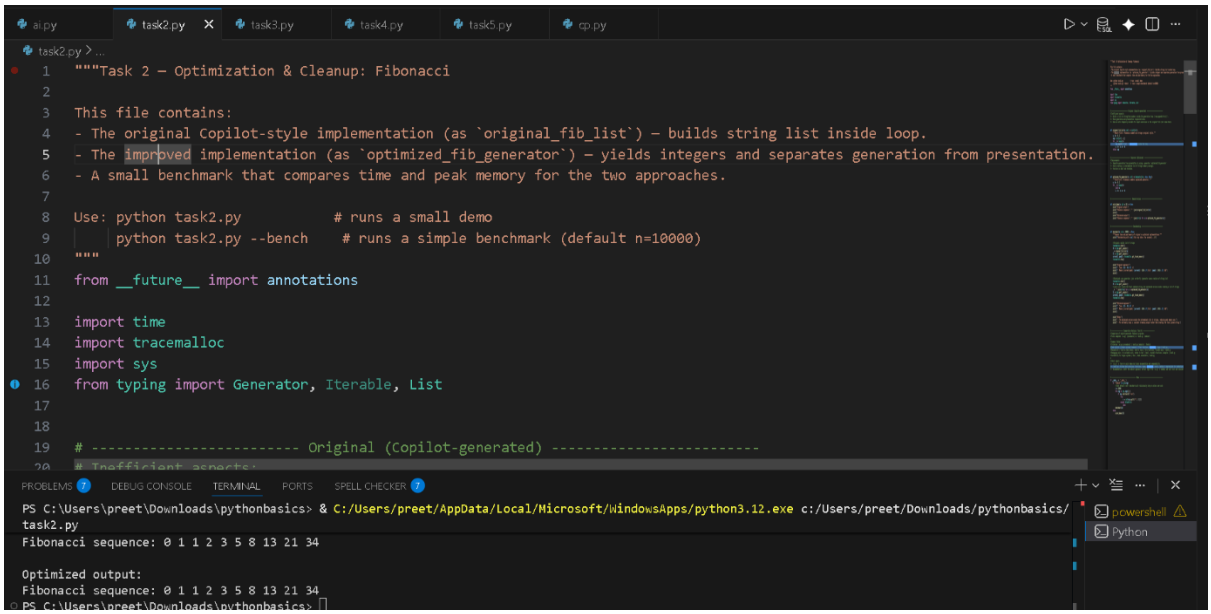
❖ Expected Output

➢ Original vs improved code

➢ Written explanation of:

▪ What was inefficient

▪ How the optimized version improves performance and readability




**OUTPUT:**

Fibonacci sequence: 0 1 1 2 3 5 8 13 21 34

Optimized output:

Fibonacci sequence: 0 1 1 2 3 5 8 13 21 34

**CODE EXPLANATION**

**Optimization & Cleanup (Fibonacci)**

**Original version (original_fib_list)**

- Generates Fibonacci numbers
- Converts each number to string inside the loop
- Stores all values in a list
  ➡️ **More memory usage**, mixed logic (generation + formatting)

**Optimized version (optimized_fib_generator)**

- Uses a **generator (yield)**
- Produces numbers one-by-one
- Conversion to string happens only when printing
  ➡️ **Less memory**, cleaner design, reusable

**Demo**

- Prints Fibonacci using both methods
- Output is the same

**Benchmark**

- Measures **time** and **memory**
- Optimized version:
    - Uses less peak memory
    - Scales better for large n

**Key takeaway**

- Generator = better performance + cleaner code
- Separate **logic (generation)** from **presentation (printing)**

## Task 3: Modular Design Using AI Assistance (Fibonacci Using Functions)

**PROMPT:**

**Task 3: Modular Design Using AI Assistance (Fibonacci Using Functions)**

❖ Scenario

The Fibonacci logic is now required in multiple modules of an application.

❖ Task Description

Use GitHub Copilot to generate a function-based Python program that:

➢ Uses a user-defined function to generate Fibonacci numbers

➢ Returns or prints the sequence up to n

➢ Includes meaningful comments (AI-assisted)

❖ Expected Output

➢ Correct function-based Fibonacci implementation

➢ Screenshots documenting Copilot's function generation

➢ Sample test cases with outputs

### Code Explanation:

**Optimization & Cleanup (Fibonacci)**

**Original version (original_fib_list)**

- Generates Fibonacci numbers
- Converts each number to string inside the loop
- Stores all values in a list
  ➡️ **More memory usage**, mixed logic (generation + formatting)

**Optimized version (optimized_fib_generator)**

- Uses a **generator (yield)**
- Produces numbers one-by-one
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  ➡️ **Less memory**, cleaner design, reusable

**Demo**

- Prints Fibonacci using both methods
- Output is the same

**Benchmark**

- Measures **time** and **memory**
- Optimized version:
  - Uses less peak memory
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**Key takeaway**

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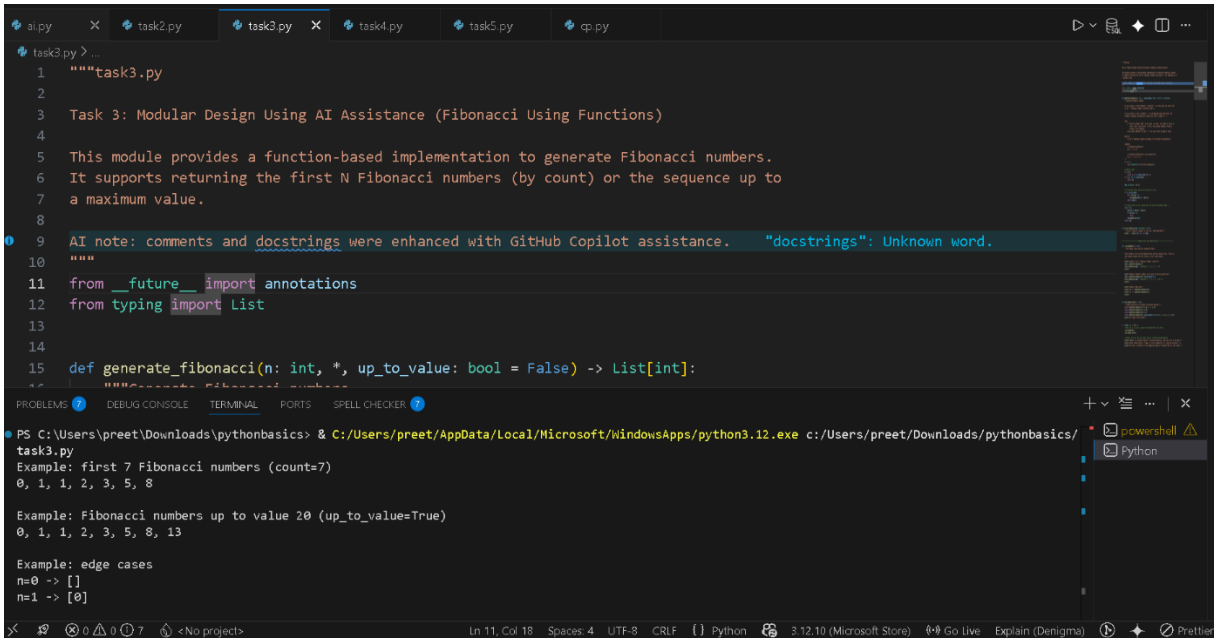
- Separate **logic (generation)** from **presentation (printing)**




**OUTPUT:**

Example: first 7 Fibonacci numbers (count=7)

0, 1, 1, 2, 3, 5, 8

Example: Fibonacci numbers up to value 20 (up_to_value=True)

0, 1, 1, 2, 3, 5, 8, 13

Example: edge cases

n=0 -> []

n=1 -> [0]

All simple tests passed.

Notes: To document Copilot's function generation, open this file in VS Code,

enable GitHub Copilot, trigger an inline suggestion for `generate_fibonacci`,

and take a screenshot of the suggestion popup or accepted code for your report.

**Task 4: Comparative Analysis – Procedural vs Modular Fibonacci Code**

**PROMPT:**

**Task 4: Comparative Analysis – Procedural vs Modular Fibonacci Code**

❖ Scenario

You are participating in a code review session.

❖ Task Description

Compare the Copilot-generated Fibonacci programs:

➢ Without functions (Task 1)

➢ With functions (Task 3)

➢ Analyze them in terms of:

▪ Code clarity

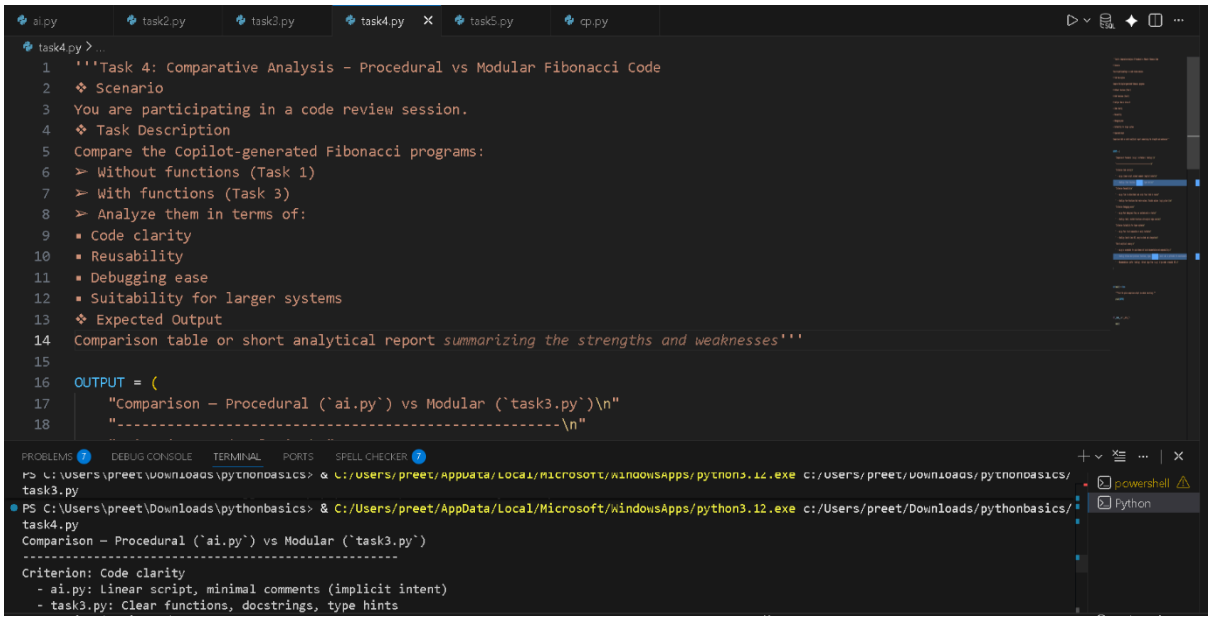
▪ Reusability

▪ Debugging ease

▪ Suitability for larger systems

❖ Expected Output

Comparison table or short analytical report




OUTPUT:

Comparison — Procedural (`ai.py`) vs Modular (`task3.py`)

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Criterion: Code clarity

- ai.py: Linear script, minimal comments (implicit intent)

- task3.py: Clear functions, docstrings, type hints

Criterion: Reusability

- ai.py: Tied to stdin/stdout and script flow — hard to reuse

- task3.py: Pure functions that return values, flexible options (`up_to_value`)

Criterion: Debugging ease

- ai.py: Must debug main flow; no isolated units or tests

- task3.py: Small, testable functions with explicit edge cases

Criterion: Suitability for larger systems

- ai.py: Poor — not composable or easily testable

- task3.py: Good — clear API, easy to extend and integrate

Short analytical summary:

- ai.py is acceptable for quick demos but lacks documentation and composability.

- task3.py follows best practices (functions, types, docstrings, tests) and is preferable for maintainability and production.

- Recommendation: prefer `task3.py`. Extract logic from `ai.py` if you need a reusable API.

## Task 5: AI-Generated Iterative vs Recursive Fibonacci Approaches (Different Algorithmic Approaches for Fibonacci Series)

**PROMPT :**

Task 5: AI-Generated Iterative vs Recursive Fibonacci Approaches (Different

Algorithmic Approaches for Fibonacci Series)

❖ Scenario

Your mentor wants to assess AI’s understanding of different algorithmic

paradigms.

❖ Task Description

Prompt GitHub Copilot to generate:

An iterative Fibonacci implementation

A recursive Fibonacci implementation

❖ Expected Output

➢ Two correct implementations

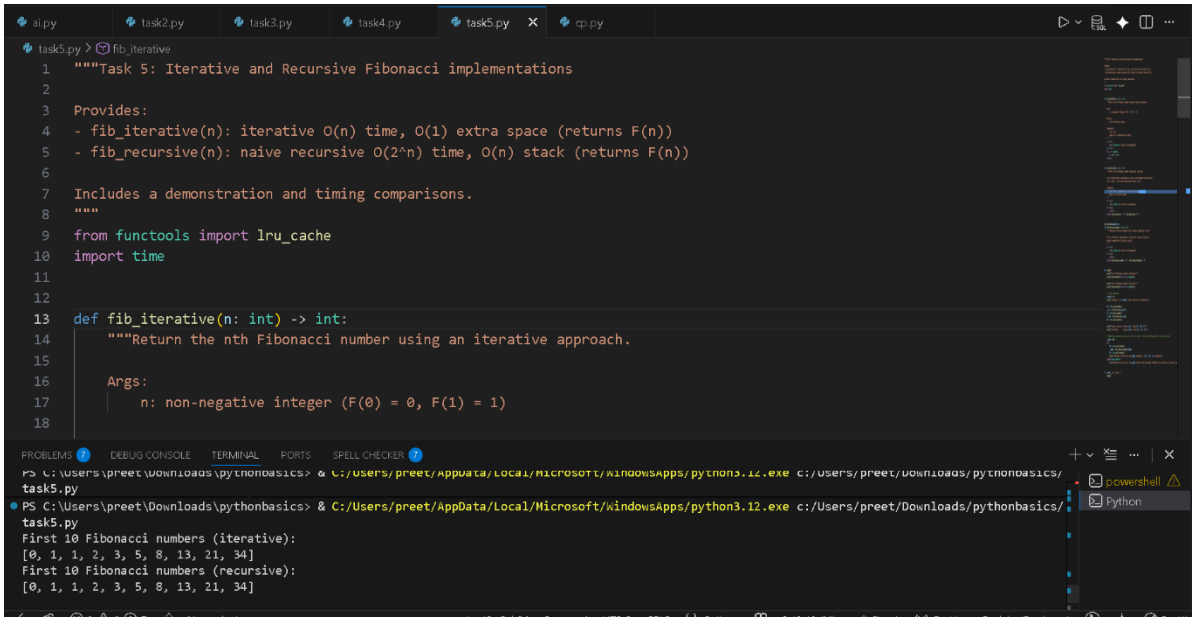
➢ Explanation of execution flow for both

➢ Comparison covering:

▪ Time and space complexity

▪ Performance for large n

▪ When recursion should be avoided




**OUTPUT:**

First 10 Fibonacci numbers (iterative):

[0, 1, 1, 2, 3, 5, 8, 13, 21, 34]

First 10 Fibonacci numbers (recursive):

[0, 1, 1, 2, 3, 5, 8, 13, 21, 34]

Timing for n=30 (naive recursive vs iterative):

naive recursive: value=832040, time=0.185535s

iterative: value=832040, time=0.000009s

memoized recursive for n=500 computed in 0.001015s (memoized)

**CODE EXPLANATION**

**Task 5: Iterative vs Recursive Fibonacci**

**fib_iterative(n)**

- **Uses a loop to calculate Fibonacci**
- **Updates values using a, b = b, a + b**
- **Time: O(n)**
- **Space: O(1)**
  ✔ **Fast and memory-efficient**

**fib_recursive(n)**

- **Follows the formula F(n) = F(n-1) + F(n-2)**
- **Repeats many calculations**
- **Time: O($2^n$)**
- **Space: O(n) (call stack)**
  ❌ **Very slow for large n**

**fib_recursive_memo(n)**

- **Uses @lru_cache to store previous results**
- **Avoids repeated work**
- **Time: O(n)**
- **Space: O(n)**
  ✔ **Fast but still uses recursion**

**Demo & Timing**

- **Prints first 10 Fibonacci numbers**
- **Compares execution time of iterative vs recursive**
- **Shows memoized recursion is much faster than naive recursion**

**Conclusion**

- **Iterative → best for performance**

- **Naive recursive → only for learning**
- **Memoized recursive → good balance, but iterative is safest for large n**